



# ORION

The Newsletter of the Ocean Research Interactive Observatory Networks

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## VENUS Project Up and Running

by VERENA TUNNICLIFFE,  
VENUS Project Director

"Why don't you have full-time Seafloor Cam?" That is possibly the most common question to the VENUS Team from journalists, visitors and students as they log on to [www.venus.uvic.ca](http://www.venus.uvic.ca). In June, VENUS (Victoria Experimental Network Under the Sea) opened its new website to the public after four months of data delivery development.

After nearly three years focused on designing our hardware arrays for first stage deployment in Saanich Inlet, British Columbia, we were faced with an equally large challenge of coping with streaming data. By June, we were archiving data from ten instruments and delivering near-real time displays for nine data streams. The

Data Management and Archive Team from NEPTUNE Canada is working with us to build a system prototype that will eventually evolve to a new design based on "lessons learned."

Some oceanographic instruments are much easier to interface to a data storage system. However, even with a scalar stream such as temperature there are questions: do we store everything the instrument measures, or just register measurements when they change? If the latter, how do you define "change"?

The Saanich array of VENUS has three acoustic instrument types: an ADCP, an acoustic profiler for zooplankton detection and three hydrophones. We are currently capturing files for the first two and delivering daily data plots

but not streaming data (yet). The size of the hydrophone files is still hampering transmission from the shore station. However, we have delivered a few examples of undersea sounds, including what we believe to be a crab walking across a hydrophone.

We also have a digital still camera (with video preview) on a pan and tilt sitting in some exciting Saanich mud (well, it's exciting to a few people). The camera can be operated remotely and scientists in Montreal, Vancouver and Israel now have control through the shore station software. But we do not offer full-time Seafloor Cam because of the potential for light pollution at the study site. At 100m in a highly productive coastal inlet, there is no visible light. We are limiting video lights to a half-hour per day. Eventually, automated programming will take flash images at preset times. With more requests to use the camera for science, we will purchase a low-light video system.

Array operations have not been without their difficulties. Power outages at the shore station have caused several data gaps requiring manual re-initiation. The majority of these occasions occur on weekends, of course. Instrument survivorship over six months has been good: one intake has clogged on one device. The camera saw surprisingly little fouling although the connector to the lights apparently failed last



VENUS Project Director Verena Tunnicliffe next to the Saanich Inlet Node prior to installation. (Photo: University of Victoria)

See VENUS, Page 2, Column 1

# Students Impress at International ROV Competition

by CAROLINE BROWN & JILL ZANDE, Marine Advanced Technology Education Center

Students dove deep with their underwater robots, but they reached for the stars at the Marine Advanced Technology Education (MATE) Center's 5th Annual International ROV Competition, held last month at NASA Johnson Space Center in Houston.

The Eastern Edge Robotics team from St. John's, Newfoundland, Canada took first place in the Explorer (advanced level) class competition. The Marine Academy of Technology & Environmental Science team from Toms River, N.J. was the first-place winner in the Ranger (intermediate level) class competition.

Other prizes awarded included "Biggest Bang for the Buck," presented to the teams that spent the least amount of money on a vehicle that performed well. That honor went to Explorer and Ranger class teams Palm Beach

Lakes High School from West Palm Beach, FL and Six Rivers Charter School from Arcata, CA, respectively. Explorer class team Long Beach City College from Long Beach, CA and Ranger class team Haltom High School from Fort Worth, TX, took top honors for design innovation or "thinking out of the box."

"I'm always amazed at what the students come up with," said Jill Zande, the MATE Center's asso-

ciate director and coordinator of the competition. "Each year we present them with a new mission challenge and a set of guidelines – their creative, skilled minds take it from there."

Organized by the MATE Center and Marine Technology Society's (MTS) ROV Committee, the competition encourages students to apply skills in science, technology, engineering, mathematics, and teamwork to create remotely

operated vehicles (ROVs or underwater robots) to accomplish mission tasks based on how ROVs are used in the real world.

This year's competition focused on the science and technology of ocean observing systems, networks of instruments that gather important data about the ocean environment. Through Ocean.US and the Ocean Research Interactive Observatory Networks (ORION) Program, multiple federal agencies are working to develop and implement a national ocean observing system that will collect and use data to help improve ocean health, predict climate change, and protect human lives and property.

NASA is one of ten federal sponsors of Ocean.US, an interagency federal government office chartered to develop a comprehensive plan for implementing ocean observing systems. The ORION Program focuses on science,

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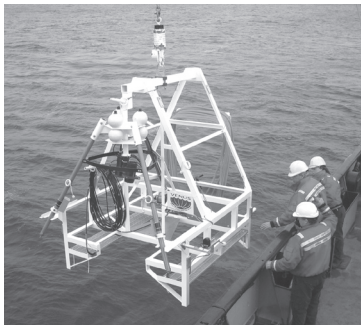


Students from Nova Scotia gather at the team's work station before their engineering presentation. (Photo: NASA)

From VENUS, Page 1

month. In August, we will pull the Camera Platform and Instrument Platform for complete servicing. Maintenance cycles are planned every six months.

The next six months are possibly the most busy. While we continue to operate VENUS in Saanich, we are also deploying a 40 km system



The VENUS digital camera system being deployed for the first time in Saanich Inlet. (Photo: University of Victoria)

with two nodes and many more instruments in the Strait of Georgia. In addition, we are recruiting science experiments and building the community while we also look for operating funds. However, we live in interesting times! And do log on to the VENUS site – if all goes well, you may see a rather unusual experiment deployed in front of the camera.

The VENUS website allows you to see data in full, monthly, weekly or updating daily plots. On the far right, a week of data from March is plotted for pressure (showing our semi-diurnal tides), and tem-

perature. In the third panel, an unfiltered acoustic image shows a day of profiler data. The undulating red line at the top is the water surface. The most distinct signal is the diurnal migration of the dense zooplankton mass that moves from feeding at the surface at night to the seafloor at dawn. (Let us know if you use any of the on-line plots for teaching.) //

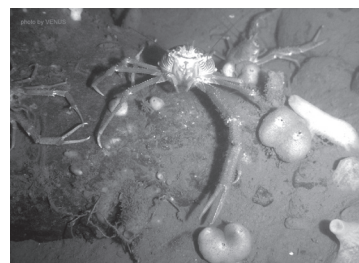
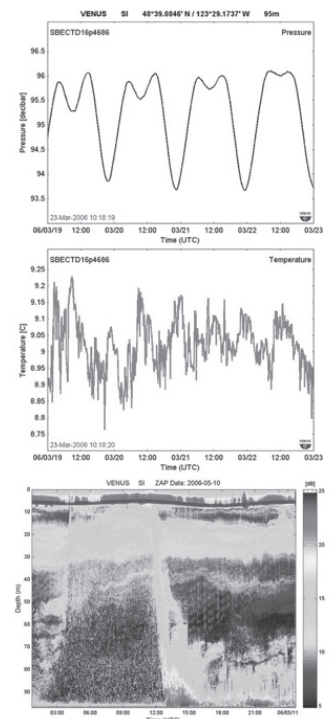


Photo of a Squat Lobster at 90 m from the digital camera. (Photo: University of Victoria)





## From ROV, Page 2

technology, education, and outreach issues associated with ocean observing. The MATE Center and the MTS ROV Committee teamed up with Ocean.US and the ORION Program to develop the underwater competition scenarios.

NASA's Johnson Space Center hosted the ROV competition at its Sonny Carter Training Facility's Neutral Buoyancy Lab (NBL). The NBL is home to one of the world's largest pools, which is used to train astronauts for spacewalks and contains a full-size mock-up of the International Space Station.

Forty teams of middle school, high school, community college, and university students created ROVs that competed in the NBL pool to accomplish tasks such as installing a complex network of underwater instruments.

The MATE Center's long-term goal is to improve marine science and technology education to meet marine workforce needs. The ROV competition is supported each year by the National Science Foundation, the National Oceanic and Atmospheric Administration, the MTS ROV Committee, and other ocean- and space-related organizations.

The next international ROV competition will be held on June 22-24, 2007, at the Marine Institute of Memorial University in St. Johns, Newfoundland, Canada.

For the complete list of winners, visit [http://www.mpcfaculty.net/jill\\_zande/2006\\_rov\\_competition\\_winners.htm](http://www.mpcfaculty.net/jill_zande/2006_rov_competition_winners.htm).

For more information about the MATE Center and the ROV competition, visit [www.marinetech.org](http://www.marinetech.org).



The C. Leon King High School team captain anxiously waits for the judges to say "go" to begin the mission. (Photo: Denise Buisman-Pilger)



The White Rock South Surrey ROV Chix team sets up at the mission station on the deck of Neutral Buoyancy Lab's pool. (Photo: NASA)

## The ORION Newsletter needs YOU!

Submissions and feedback are welcome. Send your suggestions and address changes to [orion@joiscience.org](mailto:orion@joiscience.org)

# House, Senate Committees Provide NSF Budget Increase

The U.S. Senate Committee on Appropriations approved the FY 2007 Commerce, Justice, Science Appropriations bill for fiscal year 2007 and provided NSF with \$5.99 billion. The appropriation is \$28.3 million below NSF's FY 2007 budget request and \$410.5 million over the FY 2006 enacted level. The bill is a major funding source for federal R&D, combining funding for the National Science Foundation (NSF), the

National Aeronautics and Space Administration (NASA), and the Department of Commerce.

The Ocean Observatories Initiative (OOI) received the full request of \$13.5 million as a new start in the Major Research Equipment and Facilities Construction (MREFC) account.

NSF is a key part of the administration's proposed "American

Competitiveness Initiative" (ACI), which proposes to double funding for three key physical sciences agencies over the next decade, and the 2007 budget requests the first installment of this ambitious plan.

The U.S. House of Representatives passed its version of this Appropriations bill on June 29, 2006. The House version provides NSF with its full FY 2007 request of \$6

billion, or \$439 million over the FY 2006 enacted level versus the \$411 million over the FY 2006 enacted level provided by the Senate Appropriations Committee.

The full Senate is expected to consider the bill after the fall recess.

For more information, visit: <http://www.nsf.gov/about/congress/>.

# Coastal Obs III at Work in Chesapeake Bay

by BRIAN CAMPBELL, SAIC-  
NASA GSFC, TRACY RILEY,  
Snow Hill High School (Md.),  
TIFFANY MOISAN, Ph.D. & JOHN  
MOISAN, Ph.D., NASA WFF

The kickoff CoastalObs III meeting was held at the NASA Wallops Flight Facility on Wednesday, June 21, 2006. This meeting focused on the coastal observations program of the Wallops Coastal Ocean Observation Laboratory (Wa-COOL) and its partners in scientific research and educational development. This meeting was attended by 41 people, consisting of scientists, researchers, education personnel, and high school and college interns.

## What is CoastalObs III?

This collaborative effort between the Center for Innovative technology (CIT), NASA Wallops Flight Facility (WFF), NOAA and a number of academic institutions and companies, monitors the influence of the Chesapeake Bay on the adjacent coastal ocean margin ecosystems through the development, deployment and use of various ocean observation tools.

Coastal regions within the Mid-Atlantic Bight (MAB) are directly influenced by regional freshwater fluxes that emanate from several large bay systems (Delaware and Chesapeake Bays). The outflows from these bays have high sediment loads and high levels of nutrients, particulate and dissolved organic matter (POM, DOM) that heavily influence the adjacent coastal margin ecosystems.

Our research and observational effort is developing and deploying an observing system aimed at characterizing and monitoring this influence of the Chesapeake Bay. A primary focus of this effort is to develop and apply cutting edge technologies and methodologies to support research, observation/monitoring efforts and management applications on the coastal ocean. A second focus is to develop and test new sensors, platforms, and applications that can be used to enhance this observing system and additionally support NOAA and NASA coastal ocean remote sensing activities and products.

## OASIS

CoastalObs III is concentrating on

developing, testing and deploying a fleet of solar-powered surface autonomous vehicles (Ocean-Atmosphere Sensor Integration System, OASIS) is being commercialized with support from NASA's Small Business Innovation Research (SBIR) program.

*"A primary focus . . . is to develop and apply cutting-edge technologies . . . to support research, observation/monitoring efforts and management applications on the coastal ocean."*

The project is presently completing testing of software for command and control of multiple OASIS platforms to support real-time dynamic mapping capabilities. In conjunction with this, we are developing several novel field instruments including a multi-spectral in situ fluorometer to support HAB (harmful algal bloom) detection and a robotic arm for controlled pointing of optical instruments to support above-water radiance measurements. Both devices are being developed for incorporation into OASIS platforms.

OASIS is an autonomous surface vehicle which functions as a platform for operating any number of oceanographic and meteorological instruments. It is powered by solar panels and an electric motor, can reach speeds in excess of 3 knots, and is controlled remotely by satellite communication. The applications of this platform can range from oceanographic research by scientists to search and rescue operations for the Coast Guard.

## COBY

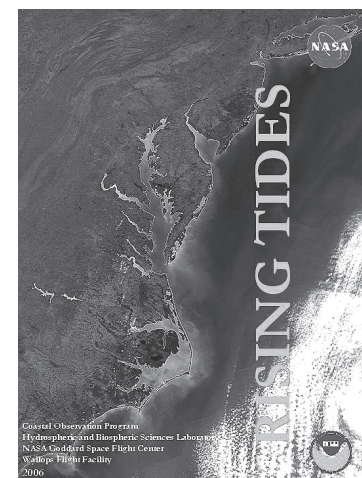
Another major focus of CoastalObs III is the Coastal Bio-Optical Buoy (COBY). COBY is a scientific mooring which will be deployed approximately 25 miles offshore of Wallops Island, Va. The buoy will house instruments

to measure the meteorological, biological, and physical oceanographic properties of the region. The COBY mooring will also profile a suite of these instruments through the water column multiple times a day to create a very detailed description of the oceanography in the area.

The instrument package that will be profiled will contain the following instruments: Seabird CTD, Wetlabs AC-S and AC-9, Wetlabs Triplet Fluorometer, and a Satlantic ISUS Nitrate Sensor. The buoy will also house a WLR-2800 radiometer and various other meteorological instruments above the water. The scheduled deployment date is late 2006. Every two weeks, an oceanographic cruise will be



The OASIS vehicle at dock on Chincoteague Island, Va.



"Rising Tides" education journal.

conducted to sample the waters between the coast and the buoy site. These COBY cruises will also allow for servicing of the buoy-maintaining the buoy superstructure, cleaning the optical surfaces of the instruments, and verifying the data storage and routine operation of the buoy controls.

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## Education and Outreach

There is also a major educational program associated with the CoastalObs III Project. An oceanography education journal publication entitled "Rising Tides" is being developed that will include cutting-edge coastal oceanography research articles teamed up with classroom and laboratory activities, web site interaction, scientist interviews, oceanography puzzles, further readings, and a teacher section. This journal will be distributed to

ton, at the microscopic level to the sampling of the phytoplankton from a research vessel and finally on to the macro imaging techniques used to monitor their growth from space.

There will also be two live cultures of phytoplankton of two different colors incorporated into the display. These will be the cultures on display in the light boxes as well as in two microscopes that will be available for visitors to look through. Furthermore, basic oceanography equipment and information for each instrument will be dispersed in the display. Instruments will include at

*"There is a unique balance between the science and education of this program and we strive to feed a multitude of audiences the knowledge of oceanography..."*

teachers at major national science teacher conferences and to teachers directly within the Delmarva coastal region.

Another component of the educational program is the development of a museum display to be initially hosted by the Wallops Flight Facility Visitor's Center. Preliminary contacts have also been made with the Baltimore Aquarium and the Virginia Marine Science Museum to assess their interest in hosting future displays to promote interest in NASA and NOAA activities in the coastal ocean.

The display's purpose is to educate the public about the jobs of oceanographers, the equipment they use, current research being done and why the research is important. It will include a collage of seven light boxes illuminating phytoplankton samples, research vessel pictures, and satellite images of phytoplankton. This will give the public perspective as they observe the smallest element of current research, phytoplank-

ton, at the microscopic level to the sampling of the phytoplankton from a research vessel and finally on to the macro imaging techniques used to monitor their growth from space. There will also be two live cultures of phytoplankton of two different colors incorporated into the display. These will be the cultures on display in the light boxes as well as in two microscopes that will be available for visitors to look through. Furthermore, basic oceanography equipment and information for each instrument will be dispersed in the display. Instruments will include at least a spectrophotometer, Secchi disk, phytoplankton net, Niskin bottle, microscopes and other oceanographic equipment. Finally, a monitor with DVD player is planned to compliment the display with research data and general information about ongoing research projects within the

Coastal Observation III Project.

Working directly with teachers and students from high schools is a major component of our education program. Recently we had 42 high school students and 7 teachers from Wilson High School in West Lawn, Pennsylvania aboard the Marine Science Consortium's R.V. Phillip Parker to conduct shipboard experiments in phytoplankton filtering, water chemistry, and trawling.


Following the onboard research, the students and teachers were taken to the NASA Wallops Flight Facility's Phytoplankton Photo-physiology Laboratory to conduct coastal oceanography experiments, including:

- Fluorometer measurements
- Microscope plankton identification
- Spectrofluorometer measurements
- Epifluorescent microscope Measurements

We believe that there is a unique balance between the science and education of this program and we strive to feed a multitude of au-



COBY close to completion at the NASA Wallops Flight Facility.

diences the knowledge of oceanography, especially the bio-rich coasts. Researchers and scientists will study the science of coastal oceanography and the students will learn cross-disciplinary knowledge in the sciences such as math, biology, chemistry, physics, optics, and remote sensing through classroom and hands-on techniques.// 

The CoastalObs Program website is <http://www.coastalobs.us>.

## Submit a Workshop Proposal!

The ORION Program is currently seeking proposals for workshops to generate ideas for individual and community experiments, which address high priority science questions using the ORION observatory facilities. Conveners are encouraged to engage a broad interdisciplinary community (scientists at different career levels, engineers, educators). Examples of science themes and information on the location and types of observatory infrastructure may be found in the ORION Science Plan and the Conceptual Network Design documents at [www.orionprogram.org](http://www.orionprogram.org). Initial installation for some coastal and global components is expected in 2008. Conveners also are expected to produce a report describing the goals and results of the workshop.

To discuss ideas and submit your proposal, contact:  
Kendra Daly, ORION Program Director [kdaly@joiscience.org](mailto:kdaly@joiscience.org)

# ORION Participates at CNSF Annual Exhibition

In early June, Joint Oceanographic Institutions conveyed the excitement of ORION and ocean observing through its exhibit booth at the Coalition for National Science Funding (CNSF) 12th annual Exhibition and Reception on Capitol Hill.

The widely complimented booth demonstrated the potential uses of high-definition video with the Ocean Observatories Initiative on a 37-inch HD flat panel television monitor showing footage from the VISIONS '05 Expedition, which used underwater robots and cameras to explore the underwater volcanoes of the northeast Pacific Ocean.

There were 325 attendees, including six Members of Congress, at this year's event, which highlighted 34 research and education projects presented by universities and institutions from across the country.

ORION Program Director Kendra Daly met with Congressional and Congressional Committee staffers and Members of Congress, including Representative Howard Coble of North Carolina's 6th District.

For an in-depth look at the VISIONS '05 Expedition, visit <http://www.visions05.washington.edu/>.



The JOI booth at the CNSF Annual Exhibition on Capitol Hill.



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# From the Program Office . . .

Dear Colleagues:

The ORION Program has accomplished several milestones in the past months.

The Conceptual Network Designs (CNDs) for the National Science Foundation's Ocean Observatories Initiative (OOI) are posted on the ORION website at <http://www.orionprogram.org/capabilities/cnd.html>.

The current CNDs are based on the community recommendations developed at the ORION Design & Implementation Workshop in March 2006 ([http://www.orionprogram.org/di\\_workshop.html](http://www.orionprogram.org/di_workshop.html)), revised cost estimates developed by the ORION Engineering Committee, and subsequent discussions and evaluations by the ORION Science and Technology Subcommittees for the Global, Regional Cabled, and Coastal components.

This was an extraordinarily difficult task given the excellence of the proposed science across all disciplines and their associated infrastructure requirements, which would have claimed several times the resources currently available through the OOI. The

process of re-evaluation of the observatory designs will continue as cost estimates are refined and we receive additional input from external reviews.

The NSF requires several reviews of its large facilities programs as one of the steps in moving towards the construction and implementation phase.

The Conceptual Design Review of the OOI was successfully completed in August. A panel of experts was convened to review the scientific case and goals, the proposed budget, the proposed schedule and milestones, the management plan, the technical readiness of the project, education and outreach plans, and a preliminary estimate of an operations budget. The panel noted that the OOI will transform the way oceanographic research will be carried out and that many people worked hard to bring the OOI of its present stage of concept design. They concluded that the concept design is credible and provides a good starting point for the next step.

One of the next steps is to contract with Implementing Organizations (IOs), which will be

responsible for the design, development, construction, and operation of the observatories.

A Request for Proposal (RFP) was released by the ORION Program Office for the Regional Cabled Observatory IO (<http://www.orionprogram.org/news/RFP.html>) in May and the Cyberinfrastructure IO was released in August. RFPs for the Coastal and Global IOs will be released in the coming weeks. The IOs and the ORION Program Office will work together to prepare for the Preliminary Design Review next year.

In the meantime, the ORION advisory committees will be meeting this fall to discuss many complex issues that need to be addressed in order to ensure an integrated observatory network that will encourage new avenues of research and new opportunities for education and public awareness.

Sincerely,

Kendra Daly  
Director, ORION Program

## Banahan Named ORION Associate Director

Susan Banahan joined JOI in August as Associate Director in the ORION Program Office.

For the past twelve years, she served as a program manager in the NOAA Coastal Ocean Program. She has managed a variety of research projects covering a broad range of oceanography, such as impacts of climate and other multiple stressors on coastal ecology, the ecology and ocean-

ography of harmful algal blooms, nutrient cycling and coastal eutrophication, and applications of remote sensing to oceanography.

Previously, Sue was a field oceanographer with more than 15 years of experience with a variety of large multi-institution research projects with aspects of chemical, biological and physical oceanography, including the NSF-funded Coastal Upwelling Ecosystem

Program (CUEA), Processes and Resources of the Bering Sea (PROBES), and Land Margin Ecosystem Research (LMER).

Her interests are in nutrient cycling, phytoplankton growth, radionuclide geochemistry, and the biogeochemistry of silica.

She completed an M.S. in chemical oceanography at the University of Alaska, Fairbanks.



Executive Editor: Kendra Daly  
Managing Editor: Emily Griffin

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Any opinions, findings, conclusions, or recommendations expressed in this publication do not necessarily reflect the views of NSF, JOI, or CORE.

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**www.orionprogram.org**

### Meetings Calendar

Sept. 13-15	ORION Observatory Steering Committee Woods Hole, Massachusetts
Sept. 18-21	MTS/IEEE Oceans '06 Boston, Massachusetts <a href="http://www.oceans06mtsieeboston.org">http://www.oceans06mtsieeboston.org</a>
Oct. 2-3	ORION Education & Public Awareness Committee Washington, DC
Oct. 9-13	Ocean Optics XVIII Montreal, Quebec <a href="http://www.oceanopticsconference.org">http://www.oceanopticsconference.org</a>
Oct. 17-19	ORION Science & Technology Advisory Committee (STAC) Portland, Oregon
Oct. 31-Nov. 2	ORION Cyberinfrastructure Committee Washington, DC
Dec. 11-15	AGU Fall Meeting San Francisco, California <a href="http://www.agu.org/meetings/fm06/">http://www.agu.org/meetings/fm06/</a>

If you are aware of upcoming meetings of interest to ocean observing please contact the ORION Project Office with the details: [orion@joiscience.org](mailto:orion@joiscience.org).